NRC Comments on Draft RSE Report

General Comment

The scope of work states, “In general, the review is intended to provide a critical review of the current remedial ground water strategy, including whether other approaches or technologies could be incorporated that may be more efficient and/or effective at achieving site closure goals. The outcome will be a summary of any recommended modifications necessary to improve performance or overcome performance deficiencies, or that would potentially reduce life-cycle costs or time to achievement of remedial goals.”

In general, the draft report appears not to provide a strong basis for decision-making because of limitations in the analysis and because it does not compare current remediation strategies to those that are recommended. As a result it lacks the information necessary to show how the revised strategy will be more efficient and/or effective at achieving site closure goals.

Specific Comments

1. Technical conclusions made in the report are routinely qualified with “may be”, “it appears”, or “likely” which detracts from the usefulness of the document because it introduces uncertainty about the effectiveness of the proposed remedies due to a lack of data, or a lack of time to fully assess the hydrologic system. Pursuing changes to the current remedial strategy with this level of uncertainty seems unwarranted. Specific comments supporting this conclusion are provided below.

    a. Section 2 - Conceptual Site Model

        Section 2.1.2 identifies the location of the former mill buildings as a potential source of contamination to the ground water. However, there is very little basis provided for such a conclusion. This section states there is “**some suggestion**” in ground water monitoring data for this conclusion. It goes on to say that the elevated uranium levels in the 1 series wells have been observed but that the “**nature of the source is unclear**.”

    b. Section 3.1 – Hydraulic Capture

        Section 3.1 states, “Capture **is not apparent** for the irrigation pumping in the downgradient portions of the uranium and selenium plumes, **nor is it clear from available data** that capture of the plume along Highway 605 east of the site is maintained.” Based on this statement, the reviewers should not draw any conclusion about the adequacy of plume capture.

    c. Section 3.4 – Ground-Water Modeling

        The report states, “The primary concern with the modeling conducted for the site is the simulation of the seepage of contaminated water from the large tailings pile. **From the available information** on this step in the modeling process, **it**

appears the modeling did not account for the **likely heterogeneity** and preferred pathways for water injected into the tailings. **It seems likely** that the flux of water is not uniform through the pile and that large volumes of the pile still have a significant amount of their original pore fluids. **The model likely over-predicts** the performance of tailings flushing."

d. Section 4.1 – Flushing of large Tailings Pile

- "..heterogeneity of the materials **has likely** prevented.."
- "..**makes it difficult** to assess.."
- "**It is not obvious** the flushing program would meets its goal by 2012.."

e. Section 4.4.1 – Slurry Wall

"This would **potentially reduce** the long-term costs for the operations, **possibly significantly.**"

f. Section 7.1.4 - Sampling Methodology

"The use of no-purge sampling techniques, such as Hydrasleeves and Snap samplers **may be considered to reduce** the time necessary to sample the wells." The use of no-purge sampling was not determined to be a time saving or cost savings alternative to the current sampling methodology utilized by Homestake.

g. Section 7.2.2 – Monitoring Network

"The number and location of control monitoring stations **may not be adequate** to meet the overall objective of ensuring compliance with the public dose limit in 10 CFR 20.1301."

Given that the NRC staff has previously determined that the number and location of control monitoring stations is adequate, the reviewer should provide additional justification for its statement.

2. Section 4.2 Downgradient Extraction and Injection

The NRC staff does not agree with the statement, "…injection of relatively clean water from other aquifers into the alluvial aquifer downgradient of the site at rates that exceed extraction complicates the control of the plumes and may do more to dilute the plume rather than treat it." We believe injection is necessary because the hydraulic control cannot be maintained in the unconfined alluvial aquifer by extraction alone. The number of extraction wells and their pumping rates would have to be increased to maintain hydraulic control to an area of this size.

USACE should re-evaluate the recommendations in this section.

3. Section 7.1.5 - Further Optimization Opportunities

Optimization tools mentioned in this section should have been used for this evaluation for a limited data set, at minimum, to provide a basis for recommended changes to the groundwater and air monitoring programs.

4. Section 7.2.2, refers to the "large area potentially impacted by the Homestake effluent releases". The report should specify what area is impacted by the Homestake tailing piles radon releases. The Shearer and Sill surveys (Health Physics, 17 (1), pp. 77-88) of radon-222 concentrations in the vicinity of uranium mill tailing piles, appear to conclude that no statistically significant difference between measured radon-222 concentrations around tailing piles and background radon-222 levels could be discerned beyond a mile from the tailing piles.

   The methods in US NRC Regulatory Guide 8.30 for radon-222 daughter measurements are better suited for assessment of worker's exposure to radon daughters indoors, and most of these methods may not be appropriate for determining either outdoor radon progeny levels or an equilibrium factor. The determination of a radon background level and an appropriate radon & radon progeny equilibrium factor are especially important and challenging to determine.

5. Section 8.0 - Although efforts were made to take a conservative approach to modeling this site, RESRAD was not designed to be used to evaluate doses from contaminated irrigation water. There are other computer codes (e.g., GENII) that can be used to evaluate doses associated with irrigation. Other options, such as the Radium Benchmark Dose, which is discussed in 40 CFR 192 and 10 CFR 40, Appendix A, Criterion 6(6) could also be used.

   Some RESRAD parameter values may impact the dose received by the future resident such as the use of 400 acres (1.6E+6 m^2) of soil irrigated with contaminated irrigation water. It is unlikely that a single individual would be exposed to the entire area while living on the site. Consideration of soil dilution associated with the construction of a house with a basement can further decrease the amount of contaminated soil a future resident may be exposed while the increase in time spent outside from 25% to 50% of the future resident's time may increase the dose. When evaluating the dose to a future resident it is also important to include all relevant exposure pathways (e.g., external exposure, inhalation, ingestion, and radon) associated with the site.

6. Section 8.2.1 - There is no basis for applying the New Mexico water quality standards for irrigation water. Removal of contaminants prior to irrigation would defeat the purpose of this remediation strategy. In addition, this section implies that the current practice of directly applying untreated extracted groundwater for irrigation is done with effluent concentrations above discharge standards. Groundwater used for irrigation has been below the discharge standards required by Homestake's license, which is based on 10 CFR 20, Appendix B, Table 2 values.

7. Section 8.2.2 indicates that uranium leaching into groundwater is not considered to be a likely risk. If the risk is small, and Homestake is meeting its regulatory requirements,

how will the suggestions offered to reduce uranium mobility in the irrigated soil make the current decommissioning strategy more efficient and/or effective at achieving site closure goals?

8. Section 9 - Summary of Conclusions and Recommendations

Bullet number 1 of Section 9.1 states that ground water remediation is very unlikely to be achieved by 2017. The basis for this statement is unclear since the RSE addendum did not determine an estimated remediation date for the current remediation strategy nor did it provide an estimated remediation date for the implementation of the recommended changes.